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Modern Use of Logic in Law: Quarterly Newsletter of the Electronic Data Retrieval Committee of the American Bar Association

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1. APPLICATIONS AND REPORTS ON RESEARCH

a. MOCK TURTLE: A PROBLEM IN ADJECTIVAL AMBIGUITY

An awareness of danger is often the best safeguard against it. Nevertheless, the ever present danger of ambiguity in the use of words does not seem to be lessened by general warnings, which have been widespread. Perhaps more specific warnings may be more effective, especially when accompanied by specific recommendations for avoidance. Allen's article on Symbolic Logic (R1) contained both warning and remedy for the ambiguity arising from the ordinary use of the word "or". In this note I deal with one case of the ambiguity which arises when qualifying words are used in such a manner as to raise some doubt as to which other words are qualified by them. Pronouns, and in particular relative pronouns like "which", may be used without making it clear to which noun they relate. Adjectives may be used without it being clear to which word they relate (R2). A particular type of such usage is found where more than one adjective is used before a noun: e.g. big yellow rose, light red car. In the case of "big yellow rose", it is difficult to conceive of any context in which it matters whether the wording is "big yellow rose", or "yellow big rose". But in the case of "light red car", we can conceive of situations in which the phrase designates a car of a light-red colour and of other situations in which it may designate a red coloured car of light weight. "Light" may qualify either "red" or "car" (R3).

One device which eliminates ambiguity has already been indicated, viz. the use of a hyphen: a "light-red car" is an unambiguous phrase. Sometimes words are joined together to make but one word as in the boxing terms "lightweight" and "heavyweight". A "light heavyweight" is a different concept from a "heavy lightweight".

There does not, however, appear to be a general rule of the ordinary use of English language always permitting the hyphenation or joinder of words: a frown or smile may greet the words "vivid-red" or "vividred", just as they may greet the novel hyphenation of a forename and surname. Some other device is required. But no other device is generally used, and very often problems arise because ambiguities exist. A recent example arose in the House of Lords case of Chappell & Co. v. Nestle Co. (R4). The phrase "ordinary retail selling price" occurred in some statutory regulations. For Viscount Simonds (R4, p. 704I) and Lord Tucker (R4, p. 710D) it meant the ordinary price prevailing on retail sales, the phrase "retail sale" covering a broad spectrum of transactions. For Lord Reid (R4, p. 710A) the phrase meant the price prevailing on ordinary retail sales. Said Viscount Simonds "Some confusion has arisen from treating the word 'ordinary' as if it qualified 'retail' rather than 'price'." Lord Reid said "I cannot interpret the phrase 'ordinary retail selling price' as applying to all sales however extraordinary in character."

It was, however, generally agreed that the ambiguity was to be resolved in the light of the context of the words. It was not suggested that assistance was to be obtained in some routine fashion from the

order of the adjectives. It is, of course, possible to create an artificial language, such as that of mathematics or symbolic logic, in which the position of symbols determines their mode of operation. The operation of brackets in mathematical notation is made dependent on their order. In the Lukasiewicz system there are precise rules for reading CNpq and NCpq. In the ordinary English language, however, there are no such rules. Some judges who have purported to resolve the ambiguity of amphibolous adjectives by appealing to ordinary usage appear to be in error about ordinary usage. Recently two English judges have reported in conflicting fashion upon ordinary usage. In Re Powell-Cotton's Resettlement (R5), the question arose as to the meaning of "ordinary preferred stock": was it a kind of preferred stock or a kind of ordinary stock; did "ordinary" qualify "stock" or "preferred"? In Carrington v. John Summers (R6), Streatfeild J. considered the phrase "overhead travelling crane": was it a kind of travelling crane or a kind of overhead crane; did overhead qualify "travelling" or "crane"? Roxburgh J. came to the conclusion that the first of the adjectives he had to deal with qualified the noun, whereas Streatfeild J. said the first of his adjectives qualified the succeeding adjective. These were quite reasonable conclusions to have come to having regard to the context, and having regard to the usage of the phrases. A sub-class of ordinary shares exists called "ordinary preferred", while no sub-class of preferred shares exists. The type of crane which moves on overhead rails is generally called an "overhead travelling crane". But both judges included in their reasoning references to the order of the adjective as being determinative. Said Roxburgh J.: "logically, if ordinary shares are divided into two sub-classes, one sub-class having a preference over the other sub-class, one would call [them] ordinary preferred stock and ordinary deferred stock. Many people would do that exactly in the same way as, if the category or class is A and one wanted to divide it into two sub-classes, one would call them, I imagine, A1 and A2 and not 1A and 2A." On the other hand, Streatfeild J. said: "on the ordinary principles of construction the word 'overhead' qualifies the word which follows immediately afterwards, namely the word 'travelling' rather than the word 'crane'." Despite the use by Roxburgh J. of the word "logically", and the use by Streatfeild J. of the phrase "principles of construction", both appear to be describing a general pattern of the use of adjectives, and producing reports that contradict each other. There is no general pattern. If the Fifth class in a school is to be divided, a choice is available of phrases: Fifth Upper and Fifth Lower no doubt are possible, but so are Upper Fifth and Lower Fifth: the latter one quite as common as Va and Vb. It is only among a few law students that the Federal Employers Liability Act is thought to be restricted to federal employers; and it is in Wonderland that Mock Turtle soup is soup made from Mock Turtles (R7).

The remedy suggested for the amphibolous operation of adjectives is to avoid the use of two adjectives wherever they may lead to ambiguity. It may be safer never to use them: but it is certainly desirable for a draftsman who finds he has used two adjacent adjectives in a draft to ask himself whether there is any ambiguity. If there is, he should

adopt a longer, but more exact, phrase. "Suits for Black Men", or "Black Suits for Men" avoids the ambiguity of Black Men's Suits. "Ordinary price on retail sales", or "ordinary price on ordinary retail sales" avoids the ambiguity of "ordinary retail selling price" (R8).

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REFERENCES

R1 66 Yale L.J. 833 (1959).

R2 Adjectival phrases may in English, like adjectives in French, follow the nouns they qualify. When they are preceded by several nouns it may not be made absolutely clear to which noun or nouns they refer. The recent English case of Cockerill v. William Cory & Son, Ltd. [1959] 2 All E.R. 561, provides an example. The words of a regulation were "No person shall ... remove ... any fencing, gangway [etc.] or other things whatsoever required by these regulations to be provided". The ambiguity consisted in the doubt whether the words "required by these regulations to be provided" qualified all the preceding nouns, viz. fencing, gangway [etc.] or only "other things". The term "amphibolous" has been used to name the type of ambiguity consisting in doubt as to where a qualification applies. Of course, this point can be made even more general, e.g., clauses, whole sentences or even sections in a statute or in a will may bear ambiguous relationships to two (or more) other clauses, sentences or sections.

R3 This type of ambiguity is not restricted to the English language. The phrase "reine Rechtslehre" suffers from a well known ambiguity. Is it the theory of pure law, or the pure theory of law, or the pure theory of pure law?

R4 [1959] 2 All E.R. 701.

R5 [1957] 1 All E.R. 404.

R6 [1957] 1 All E.R. 457.

R7 The phrase "overhead electric railway" could gramatically designate either (i) a railway powered by electricity supplied from overhead lines, in contrast to a railway powered by electricity supplied from rails, or (ii) a railway running overhead powered by electricity, in contrast with a railway running overhead powered by steam. It is usage which determines its ordinary significance. Usage is affected by the facts for which descriptions are needed. The two types of electrical supplies to railways in London have resulted in Londoners speaking of "overhead electric railway" with the first signification.

R8 The problem discussed here often arises from the imperfect resources of written notation in rendering the rests and varying tempi of speech. Variable spacing might hold, e.g., "light red car" v. "light red car"; but compositors and typists might not always mind their ems and ens.

b. RESEARCH REPORT: UNIVERSITY OF PITTSBURGH HEALTH LAW CENTER

The Health Law Center of the Graduate School of Public Health, University of Pittsburgh, was founded in 1958 to conduct a program of research and teaching of the legal aspects of public health, medicine, nursing, pharmacy, hospitals and medical care. The Center has just completed publication of a two-volume manual on hospital law and is now turning its attention to research in public health law. To accomplish its objectives the Center has been investigating techniques which would both speed up the mechanical parts of legal research and permit a greater depth of comparative research.

Simply stated, the broad aim of the Health Law Center of the University of Pittsburgh is to develop a tool for legal research using principles of information retrieval and to apply this tool to an integrated program of research in health law. In this project the Center is working in close cooperation with the Computation and Data Processing Center of the University and IBM research.

It is proposed to establish a system, using the IBM type 7070 electronic computer, soon to be available at the Computation and Data Processing Center, whereby health statutes relevant to a particular research inquiry or project can be retrieved from the total body of health laws previously stored on magnetic tape. Full texts of the health statutes of the several states will be placed on tape. Utilizing the tape "library" of statutes created, the Health Law Center will undertake a program of legal research in specific areas of health law. Concurrently, the entire tape "library" will be utilized for a series of comparative studies encompassing the whole range of federal and state health statutes. In these studies the electronic computer will perform exactly the operations for which it is best fitted, arranging and rearranging categories of statutes in response to specific directions so that the statutes may be compared and analyzed.

Pilot studies using statutory materials assembled for the Hospital Law Manual are presently in process. Upon their completion, a full scale test of information retrieval techniques is planned, using those statutes dealing with health discussed below. It is expected that a system employing automatic retrieval of statutes will be in operation within three years.

The statutes of each state and those of the federal government will be examined by the Health Law Center staff, and statutory sections relevant to health will be indicated. When all relevant sections have been marked, the books will be turned over to a service bureau and the full text of each indicated section punched on to cards.

Mechanical analysis of statutory sections by the electronic computer consists of techniques whereby certain words or phrases in each statutory section are selected as representative of the general content of that

section. In almost any statutory section some words are more indicative of the section's meaning and content than others, and these words are selected by the machine as key words. Thus, the document's relevance to a particular search is measured by the relationship of groups of words in the document to words included in the inquiry. Retrieval is further aided by a computer program which gives an alphabetical list of all the different words used in the "library" of statutes (eliminating certain common words), and the frequency with which these words occur. This list serves as a basis for constructing a thesaurus of synonyms which improves retrieval.

The machine will "read" the entire "library" at a rate of almost 10,000 words a second, matching each document against the coded entries on the inquiry card and selecting the relevant documents. Search time will be further reduced because several inquiries will be processed simultaneously. As soon as a relevant section is selected, its full text is printed by the IBM printer, at 3,600 words per minute. Printing proceeds concurrently with selection. Thus, the full texts of all relevant statutes are available, in convenient form, almost immediately upon completion of the search. The time required for searching and printing the results is practically negligible. It should be emphasized that this project does not contemplate "mechanized legal research". The electronic computer will not replace the analytical abilities of the attorney. It performs only the task of searching for and printing relevant statutes. The attorney will then be able to utilize his entire time in analysis of the statutes found.

After the tape library is complete and the statutory material is machine indexed and analyzed, the retrieval system will be tested to insure accuracy. Law students will be used to perform manual searches so that comparisons can be made between the accuracy of human and machine performance in selecting statutes. Experts will be invited to participate in this testing process.

The techniques developed to permit storage, classification and retrieval of statutes seem equally applicable to administrative regulations, local ordinances and laws of foreign countries. While the principles of storage, classification and retrieval may require some adaption, they can probably also be applied with some success to judicial decisions. With respect to all these materials, the savings in research time and money are likely to be similar to those experienced with statutes. Incorporating such materials into the retrieval system will vastly enrich the "library" available to answer an inquiry. A printing of relevant regulations, judicial decisions, local ordinances, as well as statutes, and perhaps, for comparison, relevant laws of foreign countries could then be obtained in response to an inquiry.

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2. LOGICAL THEORY

a. ALETHIC LOGIC

The system of logic, called Alethic Logic (abbreviated AL), is simply a different formulation of Lewis and Langford's system S4 (R3, p. 501). The system AL satisfies Anderson's criteria (R1, p. 18) for being a "normal alethic modal logic". In AL certain relationships between symbols, which can be interpreted as indicating the concepts of consistency, contingency, logical necessity and logical possibility, are specified.

Classical propositional calculus (abbreviated CPC) is a sub-system of AL, i.e., all the theorems and rules of inference of CPC are also either theorems or rules of inference of AL, but it is not the case that all the theorems and rules of inference of AL are either theorems or rules of inference of CPC. The FATD number of the formulation of AL presented here is F127-T3.02231-D177. Thus, this formulation of AL contains all the formation rules, transformation rules and definitions that are in the F27-T2231-D17 formulation of CPC (see MULL 59S2a) plus the following: FR7, TR16, TR17, D5, D6 and D7.

Thus, the assumptions* in this formulation of AL can be conveniently summarized as follows:

1.	Alphabet	The same as for CPC: F27-T2231-D17 with the addition of L as a primitive connective
2.	Formation Rules	FR1 FR2 FR3 FR5 FR7
3.	Transformation Rules	TR1 TR4 TR5 TR8 TR11 TR16 TR17
4.	Definitions	D1-D7

The six assumptions of this formulation of AL which are not assumptions of CPC: F27-T2231-D17 will now be described.

FR7 If formula e is a WFF, then Le is a WFF.

TR16 Li * L* . From the proof of w within an L-sub-proof that has
* * . no suppositions, it is valid to infer Lw.
* * . (If a proposition can be proved within a sub-proof
*_ * w into which only necessary propositions, i.e., propo-
* Lw sitions that begin with L (or their equivalents), can be reiterated, then that proposition is a necessary proposition.)

---

* The word "assumptions" is used here as a generic term to refer to formation rules, axioms, transformation rules and definitions.

When there is some restriction imposed upon reiteration into a given subproof, the restriction is indicated by a symbol which precedes that sub-proof. Thus, in TR16 the L which precedes the right-most sub-proof indicates that reiteration into that sub-proof is restricted, that only L-expressions can be reiterated into that sub-proof. (See R2, pp. 64-65).

TR17	Lo	*_Lw * w	From Lw, it is valid to infer w. (If a proposition is necessarily true, then that proposition is true.)
D5	Md	*_Mw *_ * NLNw	Mw is equal by definition to NLNw. (It is stipulated that to say that a proposition is possibly true is an abbreviated way of saying that that proposition is not necessarily not true.)
D6	C4d	*_C4vw *_ * MKvw	C4vw is equal by definition to MKvw. (It is stipulated that to say that one proposition is consistent with a second proposition is an abbreviated way of saying that it is possible that both of those propositions are true.)
D7	C5d	*_C5w *_ * KMwMNw	C5w is equal by definition to KMwMNw. (It is stipulated that to say that a proposition is contingent is an abbreviated way of saying that that proposition is possibly true and also possibly not-true.)

With the set of assumptions made in AL, a metatheorem about AL called the possibility-in metatheorem (abbreviated Mi) can be proved.

MT1	Mi	*_w * Mw	From w, it is valid to infer Mw. (If a proposition is true, then it is possible that that proposition is true.)

Another way of writing MT1, a way that has the convenience of being all on one horizontal line, is as follows:

Cl/2 w Mw

In general *_v can be transformed into an equivalent expression Cl/2 v w
*_w

by replacing *_ by Cl/2 and replacing the vertical juxtaposition of v
*

and w by the horizontal juxtaposition of v and w (the bottom term becoming the right-most term). In the present notation every expression that begins with 'Cl/2' will be called a rule of inference. Thus, all transformation rules are rules of inference. Also, all metatheorems that begin with 'Cl/2' are rules of inference. The proof of MT1 is as follows:

MT1 (Mi) C1/2 w Mv

1* w	s
2* * LNv	s
3* * Nv	2,Lo
4* * w	1R
5* NLNv	2-3-4,Ni
6* Mv	5,Md

The members of the following set of metatheorems, which will be called the basic set of metatheorems, can be proved in AL:

MT1	Mi	possibility-in	MT2	Mo	possibility-out
MT3	NLi	negation-necessity-in	MT4	NLo	negation-necessity-out
MT5	NMi	negation-possibility-in	MT6	NMo	negation-possibility-out
MT7	LAi	necessity-disjunction-in	MT8	---	
MT9	LKi	necessity-conjunction-in	MT10	LKo	necessity-conjunction-out
MT11	MAi	possibility-disjunction-in	MT12	MAo	possibility-disjunction-out
MT13	---		MT14	MKo	possibility-conjunction-out

MT2 Mo
* Mv
* LCvw
* Mv

From Mv and LCvw, it is valid to infer Mv. (If one proposition is possibly true and it is necessary that that first proposition implies a second proposition, then that second proposition is possibly true.)

MT2 (Mo) C1/2 K1/2.Mv.LCvw Mv

1* Mv	s
2* LCvw	s
3* * LNv	s
4* * L* Nw	3R,Lo
5* * * Cvw	2R,Lo
6* * * Nv	4,5,MT-CPC
7* * LNv	4-6,Li
8* * NLNv	1R,Md
9* NLNw	3-7-8,Ni
10* Mw	9,Md

Notice three things about the proof of MT2.

1. When an expression is written in notation <u>horizontally</u>, metalinguistic conjunction is indicated by K1/2; but when an expression is written <u>vertically</u>, metalinguistic conjunction is indicated by vertical juxtaposition.

2. Step 8 is justified by MT-CPC. This is intended to indicate that by a metatheorem of CPC it is valid to infer Nv from Nw and Cvw. To show that Cl/2 Kl/2.Nw.Cvw Nv is a metatheorem of CPC by proving this expression in CPC is not difficult to do, should the reader wish to further justify step 8.

3. Informal punctuation is used as an aid for reading the metatheorem. The periods following Kl/2 indicate that Kl/2 connects the WFF's that immediately follow the periods, i.e., Kl/2._._; and in this example the blanks are filled by Nv and LCvw.

MT3 NLi *_MNw
*_NLw

From MNw, it is valid to infer NLw. (If it is possible that a proposition is not true, then that proposition is not necessarily true.)

MT4 NLo *_NLw
*_MNw

From NLw it is valid to infer MNw. (If a proposition is not necessarily true, then that proposition is possibly not true.)

MT3 (NLi) Cl/2 MNw NLw

1*_MNw	s
2* *_Lw	s
3* * NLNNw	1R,Md
4* * L* w	2R,Lo
5* * * NNw	4,NNi
6* * LNNw	4-5,Li
7* NLw	2-3-6,Ni

MT4 (NLo) Cl/2 NLw MNw

1*_NLw	s
2* *_NMNw	s
3* * NNLNNw	2,Md
4* * LNNw	3,NNo
5* * L* NNw	4R,Lo
6* * * w	5,NNo
7* * Lw	5-6,Li
8* * NLw	1R
9* MNw	2-7-8,Ni,NNo

MT5 NMi *_LNw
*_NMw

From LNw, it is valid to infer NMw. (If a proposition is necessarily not true, then it is not possible for that proposition to be true.)

MT6 NMo *_NMw
*_LNw

From NMw, it is valid to infer LNw. (If it is not possible for a proposition to be true, then that proposition is necessarily not true.)

MT5 (NMi) Cl/2 LNw NMw

1*_LNw	s
2* *_Mw	s
3* * NLNw	2,Md
4* * LNw	1R
5* NMw	2-3-4,Ni

MT6 (NMo) Cl/2 NMw LNw

1*_NMw	s
2* NNLNw	1,Md
3* LNw	2,NNo

MT7 LAi *_ALvLw
*_LAvw

From ALvLw, it is valid to infer LAvw. (If at least one of two propositions is necessarily true, then it is necessary that at least one of those propositions is true.)

MT8 LAo NOT PROVABLE

MT7 (LAi) C1/2 ALvLw LAvw

1*_ALvLw	s
2* *_Lv	s
3* * L* v	2R,Lo
4* * * Avw	3,Ai
5* * LAvw	3-4,Li
*	
6* *_Lw	s
7* * LAvw	similar to 2-5
8* LAvw	1,2-5,6-7,Ao

MT8 The statement of LAo if it were provable would be:

From LAvw, it is valid to infer ALvLw.

However, the assumptions made in system AL have been especially chosen so that LAo would not be provable. The motivation for so choosing the assumptions is that if LAo is provable, then it will be possible to prove certain theorems about the real world that seem unacceptable.

For example, let v represent the proposition:
Most alert lawyers will soon realize the usefulness of modern logic in their work.
and let w represent the proposition:
Most alert lawyers will not soon realize the usefulness of modern logic in their work.
Then, in logical systems in which LAo is provable if LAvw is true, it will be valid to infer that ALvLw is true. Notice the results when v and w represent the indicated propositions. The proposition LAvw is evidently true about the real world, but ALvLw is most assuredly not. Although it is true that:
It is necessarily the case that either
1) most alert lawyers will soon realize the usefulness of modern logic in their work or
2) most alert lawyers will not soon realize the usefulness of modern logic in their work.
It is clearly not true that:
It is either
1) necessarily the case that most alert lawyers will soon realize the usefulness of modern logic in their work or
2) necessarily the case that most alert lawyers will not soon realize the usefulness of modern logic in their work.
The fact that the provability of LAo would lead to counter-intuitive results such as these is the reason for constructing the system AL so that LAo will not be provable.

MT9 (LKi) *_KLvLw
* LKvw

From KLvLw, it is valid to infer LKvw. (If each of two propositions is necessarily true, then the conjunction of those two propositions is necessarily true.)

MT10 LKo *_LKvw
* KLvLw

From LKvw, it is valid to infer KLvLw. (If the conjunction of two propositions is necessarily true, then each of those two propositions is necessarily true.)

MT9 (LKi) C1/2 KLvLw LKvw

1*	KLvLw	s
2*	Lv	1,Ko
3*	Lw	1,Ko
4*	L* v	2R,Lo
5*	* w	3R,Lo
6*	* Kvw	4,5,Ki
7*	LKvw	4-6,Li

MT10 (LKo) C1/2 LKvw KLvLw

1*	LKvw	s
2*	L* Kvw	1R,Lo
3*	* v	2,Ko
4*	* w	2,Ko
5*	Lv	2-3,Li
6*	Lw	2-4,Li
7*	KLvLw	5,6,Ki

MT11 MAi *_AMvMw
* MAvw

From AMvMw, it is valid to infer MAvw. (If at least one of two propositions is possibly true, then it is possible that at least one of those two propositions is true.)

MT12 MAo *_MAvw
* AMvMw

From MAvw, it is valid to infer AMvMw. (If it is possible that at least one of two propositions is true, then at least one of those two propositions is possibly true.)

MT11 (MAi) C1/2 AMvMw MAvw

1*	AMvMw	s
2*	* NMAvw	s
3*	* LNAvw	2,NMo
4*	* L* NAvw	3R,Lo
5*	* * KNvNw	4,NAo
6*	* * Nv	5,Ko
7*	* * Nw	5,Ko
8*	* LNv	4-6,Li
9*	* LNw	4-7,Li
10*	* K LNv LNw	8,9,Ki
11*	* NA NLNv NLNw	10,NAi
12*	* NA Mv Mw	11,Md
13*	* AMvMw	1R
14*	MAvw	2-12-13,Ni,NNo

MT12 (MAo) C1/2 MAvw AMvMw

1*	MAvw	s
2*	* NMv	s
3*	* * NMw	s
4*	* * LNv	2R,NMo
5*	* * LNw	3R,NMo
6*	* * L* Nv	4R,Lo
7*	* * * Nw	5R,Lo
8*	* * * KNvNw	6,7,Ki
9*	* * * NAvw	8,NAi
10*	* * LNAvw	6-9,Li
11*	* * NLNAvw	1R,Md
12*	* Mw	3-10-11,Ni,NNo
13*	CNMvMw	2-12,Ci
14*	AMvMw	13,Ad

MT13 MKi NOT PROVABLE

MT14 MKo *_MKvw
* KMvMw

From MKvw, it is valid to infer KMvMw. (If it is possible that the conjunction of two propositions is true, then each of these two propositions is possibly true.)

MT13 The statement of MKi if it were provable would be:

From KMvMw, it is valid to infer MKvw.

However, MKi leads to the same kind of counter-intuitive results as LAo would. This can be seen by letting v and w represent the same propositions as those described in the discussion of LAo. Then, KMvMw is true (i.e., it is possible that most lawyers will soon realize the usefulness of modern logic in their work, and it is possible that most lawyers will not soon realize the usefulness of modern logic in their work), although MKvw (i.e., it is possible that (1) most lawyers will soon realize the usefulness of modern logic in their work and (2) most lawyers will not soon realize the usefulness of modern logic in their work) is not. But, MKi would allow the truth of MKvw to be inferred from the truth of KMvMw. Thus, it is not desirable that MKi be provable in AL.

MT14 (MKo) C1/2 MKvw KMvMw

1*	_MKvw	s
2*	* _NKMvMw	s
3*	* ANMvNMw	2,NKo
4*	* * _NMv	s
5*	* * LNv	4,NMo
6*	* * L* Nv	5R,Lo
7*	* * * ANvNw	6,Ai
8*	* * * NKvw	7,NKi
9*	* * LNKvw	6-8,Li
	* *	
10*	* * _NMw	s
11*	* * LNKvw	similar to 4-9
12*	* LNKvw	3,4-9,10-11,Ao
13*	* NLNKvw	1R,Md
14*	KMvMw	2-12-13,Ni,NNo

The following theorems can be proved in AL:

T1 LC AA.LCNvw.LCuv.LCuw LCuAvw
T2 LC A.C4uv.C4uw C4.Avw.u
T3 LC A.C4uv.C4uw C4.u.Avw
T4 LC A.Cuv.Cvw CKuvw
T5 LC A.Cuv.Cuv CuAvw
T6 LC A.KNvv.Kvw v
T7 LC A.Kuv.Kuw KAvwu
T8 LC A.LCuw.LCvw LCKuvw
T9 LC A.LCuv.LCuw LCuAvw
T10 LC A.MNv.MNw MNKvw
T11 LC AMvMw MAvw
T12 LC A.NMv.NMw NMKvw
T13 LC A.NMNv.NMNw NMNAvw
T14 LC Avv v
T15 LC Avw Awv
T16 LC AuAvw AAuvw
T17 LC AuAvw AvAuw
T18 LC CAuvw K.Cuw.Cvw
T19 LC CKuvw CuCvw
T20 LC C4.Avw.u A.C4uv.C4uw
T21 LC C4Kvwu C4uv
T22 LC C4Kvwu C4uw
T23 LC C4Kvwu C4vw
T24 LC C4Kvwu K.C4uv.C4uw
T25 LC C4Kvwu KK.C4uv.C4uw.C4vw
T26 LC C4Kvwu KKKKK.C4uu.C4uv.C4uw C4vv.C4vw.C4ww
T27 LC C4vv A.C4Nwv.C4vw
T28 LC C4.u.Avw A.C4uv.C4uw
T29 LC C4vw C4vv
T30 LC C4vw C4wv
T31 LC C4vv NK.LCvw.LCvNw

T32 LC Cvw C.Auv.Auw
T33 LC Cuv C.Auw.Avw
T34 LC Cuv C.Cvw.Cuw
T35 LC Cvw C.Cuv.Cuw
T36 LC Cuv C.Kuw.Kvw
T37 LC Cvw CNwNv
T38 LC CuCvw CKuvw
T39 LC KAvwu A.Kuv.Kuw
T40 LC K.CKvww2.Cuv CKuww2
T41 LC K.C4uw.LCuv C4vw
T42 LC K.C4vv.LCvw C4vw
T43 LC K.C4vv.LCvw C4ww
T44 LC K.C4vv.LCvw NLCvNw
T45 LC K.C4vv.NC4vw NLCvw
T46 LC K.C4vv.NC4ww NLCvw
T47 LC K.Cuw.Cvw C.Auv.w
T48 LC K.Cuw.Cvw2 C.Auv.Aww2
T49 LC K.Cuw.Cvw2 C.Kuv.Kww2
T50 LC K.Cuv.Cvw Cuw
T51 LC K.Cvw.v Kvw
T52 LC KK.C4uv.LCuv.LCvw2 C4ww2
T53 LC K.KLCuvLCvw.LCww2 LCuw2
T54 LC KK.LCuw.LCvw2.NC4ww2 NC4uv
T55 LC K.LCKuvw.LCKNvuv LCuw
T56 LC K.LCKvww2.LCuv LCKuww2
T57 LC K.LCKuvw.NMNu LCvw
T58 LC K.LCuw.LCvw LC.Auv.w
T59 LC K.LCuw.LCvw2 LC.Auv.Aww2
T60 LC K.LCuw.LCvw2 LC.Kuv.Kww2
T61 LC K.LCuv.LCvw LCuw
T62 LC K.LCuv.LCuw LC.u.Avw
T63 LC K.LCuv.LCuw LC.u.Kvw
T64 LC K.LCvw.MNw MNv
T65 LC K.LCvw.Mv Mw
T66 LC K.LCuv.NC4vw NC4uw
T67 LC K.LCvw.NC4vw NC4vv
T68 LC K.LCvw.NC4ww NC4vv
T69 LC K.LCvw.NMNv NMNw
T70 LC K.LCvw.NMw NMv
T71 LC K.LCuNw.LCvw NC4uv
T72 LC K.LCvNw.LCvw NC4vv
T73 LC K.NC4Nwv.NC4uw NC4uv
T74 LC K.NMNv.NMNw LEvw
T75 LC K.NMv.NMw LEvw
T76 LC KNwv NLCvw
T77 LC Kvw w
T78 LC Kvw C4vw
T79 LC KvCvw w
T80 LC Kvw NLCvNw
T81 LC LC.Auv.w K.LCuw.LCvw
T82 LC LC.Kuv.w LC.KNwu.Nv
T83 LC LC.Kuv.w LC.KNwv.Nu
T84 LC LCNvv v
T85 LC LCNvw LCNwv
T86 LC LCNvNw LCwv
T87 LC LCvw Cvw
T88 LC LC.u.Kvw K.LCuv.LCuw
T89 LC LCuv LC.Auw.Avw
T90 LC LCuw LC.Kuv.w
T91 LC LCvw LC.Kuv.w
T92 LC LCuv LC.Kuw.Kvw
T93 LC LCvw LCNwNv
T94 LC LCuv LC.u.Avw
T95 LC LCuw LC.u.Avw
T96 LC LCvw NKNwv
T97 LC LCvNw LCwNv
T98 LC LCvNw NKvw
T99 LC LCvNv Nv
T100 LC MKvw KMvMw
T101 LC MKvw Mv
T102 LC MKvw Mw
T103 LC MNv MNKvw
T104 LC MNw MNKvw
T105 LC Mv MAvw
T106 LC Mw MAvw
T107 LC NC4vv NC4vw
T108 LC NC4ww Nw
T109 LC NCvw CNvw
T110 LC NCvw CNvNw
T111 LC NCvw Cwv
T112 LC NCvw CvNw
T113 LC NCvw CwNv
T114 LC NCvNw Cvw
T115 LC NLCvv MNv
T116 LC NLCvw Mv
T117 LC NMAvw K.NMv.NMw
T118 LC NMAvw NMv
T119 LC NMAvw NMw
T120 LC NMNKvw K.NMNv.NMNw
T121 LC NMNKvw NMNv
T122 LC NMNKvw NMNw
T123 LC NMNw w
T124 LC NMNv LCvv
T125 LC NMNw Mw
T126 LC NMNv NMNAvw
T127 LC NMNw NMNAvw
T128 LC NMv LCvw
T129 LC NMv NMKvw
T130 LC NMw NMKvw
T131 LC NMw Nv
T132 LC NNw w
T133 LC Nv Cvw
T134 LC Nw MNw
T135 LC Nv NKvw
T136 LC Nw NKvw
T137 LC Nv NLCNvv
T138 LC v A.KNvv.Kvw
T139 LC v Avw

T140 LC w Avv
T141 LC w C4vw
T142 LC v Cvv
T143 LC w Mw
T144 LC v NLCvNv
T145 LE A.Auv.w A.u.Avw
T146 LE A.C4vw.C4Nvv A.MKvw.MKNwv
T147 LE A.C4vw.C4Nvv C4vv
T148 LE A.C4vw.C4Nwv Mv
T149 LE A.C4uv.C4uw C4.u.Avw
T150 LE A.KNww.v v
T151 LE A.KNwv.Kvw v
T152 LE A.KNvv.Kvw K.ANww.v
T153 LE A.Kvw.u K.Auv.Auw
T154 LE A.Kuv.Kuw K.Avw.u
T155 LE A.MKvw.MKNwv Mv
T156 LE AMvMw MAvw
T157 LE ANvw Cvw
T158 LE Avv v
T159 LE C.KNwu.Nv C.KNwv.Nu
T160 LE C.KNwu.Nv C.Kuv.w
T161 LE C.KNwv.Nu C.Kuv.w
T162 LE CNww w
T163 LE CNwNv Cvw
T164 LE C4.Kuv.w C4.Kuw.v
T165 LE C4.Kuv.w C4.Kvw.u
T166 LE C4.Kuw.v C4.Kvw.u
T167 LE C4.Kvw.Kvw C4vw
T168 LE C4.Kvw.Kvw MKvw
T169 LE C4.Kvw.Kvw NLCvNw
T170 LE C4NwNw MNw
T171 LE C4NwNw NLCNww
T172 LE C4vw C4wv
T173 LE C4vw MKvw
T174 LE C4ww Mw
T175 LE C4vw NLCvNw
T176 LE C4ww NLCwNw
T177 LE C.u.Kvw K.Cuv.Cuw
T178 LE Cvw NKvNw
T179 LE CvNv Nv
T180 LE Evw K.Cvw.Cwv
T181 LE K.ANww.v v
T182 LE K.Avw.v v
T183 LE K.Cvw.v Kvw
T184 LE K.KNwv.w KNww
T185 LE K.Kuv.w K.u.Kvw
T186 LE K.LCNvv.LCvv NMNv
T187 LE K.LCuv.LCvw LC.Auv.w
T188 LE K.LCuv.LCuw LC.u.Kvw
T189 LE K.LCvNw.LCvw K.NC4Nvv.NC4vw
T190 LE K.LCvNw.LCvw NMv
T191 LE K.NC4Nvv.NC4vw NMv
T192 LE K.NKNwv.v Kvw
T193 LE K.NMNv.NMNw NMNKvw
T194 LE K.NMv.NMw NMAvw
T195 LE Kww w
T196 LE Kvw NANvNw
T197 LE LC.Avw.w LCvw
T198 LE LC.KNwv.NKNwv LCvw
T199 LE LC.KNwv.NKNwv NC4.KNwv.KNwv
T200 LE LC.KNwu.Nv LC.KNwv.Nu
T201 LE LC.KNwu.Nv LC.Kuv.w
T202 LE LC.KNwv.Nu LC.Kuv.w
T203 LE LC.Kuv.w LC.u.Cvw
T204 LE LC.Kuv.w LC.v.Cuw
T205 LE LCNvw LCNwv
T206 LE LCNww NC4NwNw
T207 LE LCNvNw LCvw
T208 LE LC.u.Cvw LC.v.Cuw
T209 LE LCvw LC.v.Kvw
T210 LE LCvw NC4.KNwv.KNwv
T211 LE LCvw NC4Nwv
T212 LE LCvw NMNCvw
T213 LE LCww NMNv
T214 LE LCvNw LCwNv
T215 LE LCvNw NC4.Kvw.Kvw
T216 LE LCvNw NC4vw
T217 LE LCwNw NC4ww
T218 LE LCvNw NMKvw
T219 LE LCwNw NMv
T220 LE MKvw NLCvNw
T221 LE MNv NLCNww
T222 LE Mv NLCwNw
T223 LE NC4.Kvw.Kvw NC4vw
T224 LE NC4.Kvw.Kvw NMKvw
T225 LE NC4NwNw NMNv
T226 LE NC4vw NMKvw
T227 LE NC4ww NMv
T228 LE NCvw KNwv
T229 NC4Nww
T230 NMKNww
T231 NMNANww

These theorems are arranged in the alphabetic order of their respective theorem-patterns (See MULL 5952a11).

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Yale Law School

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b. NOTE ON SIMPLIFYING THE REITERATION RULE

The reiteration rule, TR1, included in the F27-T2231-D17 formulation of CPC (See MULL 59S2a6) is more complicated than it needs to be. In its present form the reiteration rule reads:

TR1
```
*_w
* * w
* * * w
* * * * w
   ... etc.
```

However, if a reiteration rule of the following form is assumed

```
*_w
* * w
```

then the present TR1 can be proved. Therefore, in order to achieve a formulation of CPC that will have independent assumptions, this simpler reiteration rule will be used rather than the present TR1. Hereafter when 'R' (or 'TR1') is used, it will refer to:

```
*_w
*_* w
```

rather than to:

```
*_w
*_* w
* * * w
* * * * w
   ... etc.
```

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c. NOTE ON THE USE OF DEFINITIONS TO JUSTIFY STEPS IN PROOFS

Note that the definitions, D5, D6 and D7 in the F127-T3.02231-D177 formulation of AL above, are written in the form:

```
*_v
*_
*_w
```

In horizontal notation definitions are often written in the form:

v =df w

Another way of writing definitions in horizontal notation is:

El/2vw

Just as:

*_v
*_
*_w

is intended to be an abbreviation for:

*_v and *_w
*_w *_v

it is intended that

El/2vw

be an abbreviation for:

Kl/2 Cl/2vw Cl/2wv

When a definition is so regarded, i.e., as being an abbreviation for a pair of transformation rules, then strictly speaking the following justifications in the proofs of metatheorems about CPC are inadequate:

MT5 step 4, MT6 step 3 and MT10 step 2
(See MULL 59S2a 13-14)

Thus, in step 4 of MT5 if Kd is regarded as being the same as the pair, Ki and Ko, then NANvNw can be inferred from Kvw by means of Kd. However, until the metatheorem Cl/2 NKvw NNANvNw has been proved, it is not valid to infer NNANvNw immediately from NKvw. Of course, Cl/2 NKvw NNANvNw is provable in CPC; and this metatheorem would be a more appropriate justification for step 4 of MT5 than Kd.

The following are alternative proofs of MT5, MT8 and MT10 that do not contain justifications that are inadequate in this way:

MT5 (Ki) Cl/2 Kl/2.v.w Kvw

1*	v	s
2*	_v	s
3*	*_ANvNw	s
4*	* CNNvNw	3,Ad
5*	* NNv	1R,NNi(MT2)
6*	* Nw	4,5,Co
7*	* w	2R
8*	NANvNw	3-6-7,Ni
9*	Kvw	8,Kd

MT8 (NAo) C1/2 NAvw KNvNw

1*	NAvw	s
2*	* ANNvNNw	s
3*	* * NNv	s
4*	* * v	3,NNo
5*	* * Avw	4,Ai(MT3)
	* *	
6*	* * NNw	s
7*	* * w	6,NNo
8*	* * Avw	7,Ai(MT3)
9*	* Avw	2,3-5,6-9
10*	* NAvw	1R
11*	NANNvNNw	2-9-10,Ni
12*	KNvNw	11,Kd

MT10 (NKo) C1/2 NKvw ANvNw

1*	NKvw	s
2*	* NANvNw	s
3*	* Kvw	2,Kd
4*	* NKvw	1R
5*	NNANvNw	2-3-4,Ni
6*	ANvNw	5,NNo

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3. REVIEWS AND ABSTRACTS

a. Teaching Machines, by B. F. Skinner, 128 SCIENCE 969 (1958)

The only thing which appears to be growing at a faster rate than the impending educational crisis is the number of proposed solutions to that crisis. Unfortunately, curriculum changes, pay raises for teachers, and educational television are on the order of fingers-in-the-crumbling-dike solutions; what is needed is a new dam. In probably the most provocative solution to the education problem generated in the past decade, Professor B. F. Skinner, a Harvard experimental psychologist, proffers the blueprints for that dam.

Professor Skinner first notes that education, if it is going to deal with its problems, must first become more efficient. This suggests instrumentation. However, Skinner points out that merely increasing the number of audio-visual aids is not sufficient. Such devices merely present material, and they do nothing to insure that the student will interact effectively with the material displayed. To insure active participation on the part of the learner, the machine must not only present material, but also must have some provision for receiving responses to such material. In addition, the machine should be able to provide immediate feedback on the appropriateness of such responses, thus providing the "contingencies of reinforcement" necessary to bring certain verbal responses under the control of selected stimuli.

Devices which incorporated these features were being developed by S. L. Pressey in the 1920's, as Dr. Skinner points out. Pressey's devices were of the "multiple-choice" type. The machine presented a series of test items, to which students responded by pressing appropriate buttons. The machine would then score the response as right or wrong, thus providing the student with feedback in time to modify his behavior. It is at this point that Skinner and Pressey part ways. Skinner maintains that we want the learner to compose appropriate responses in the presence of selected stimuli; it is not enough that he merely be able to recognize an answer from a set of alternatives which include unwanted, incorrect answers. To accomplish this "the student must pass through a carefully designed sequence of steps, often of considerable length. Each step must be so small that it can always be taken, yet in taking it the student moves somewhat closer to fully competent behavior." The construction of such a "carefully designed sequence" Skinner terms programming, and he describes several machines which have been designed to present programs in diverse topics such as spelling, arithmetic, and psychology. Skinner next describes techniques for construction of programs of various sorts and gives examples of programs so produced. After pointing out that program construction is not an easy matter, he reassures us that there is a final authority of the efficacy of the program -- namely, the student. Since the machine records the student's response as he proceeds, the programmer is in a unique position to evaluate and modify his products on the basis of the results they produce. As Skinner says, "no comparable feedback is available to the lecturer, textbook writer, or maker of films."

Having described both the hardware machines and the programs which can be constructed to use in these machines, Skinner next deals with some of the implications which may arise if his suggestions are taken seriously. Can we maintain a student's interest in a topic in the absence of the traditional fear of failure? Will "spoon-feeding" with easy programmed material produce students who are unable to think for themselves? Will students become overly dependent on the machines and be unable to learn with traditional devices such as text books? Will machines replace teachers? The intrepid Professor Skinner rolls up his sleeves and takes on all comers. The reader himself must judge the adequacy of his answers to these disturbing questions. A final comment is more a tribute to Skinner's inventiveness than a criticism of a significant and stimulating paper. It is this: while introducing (or reviewing) the concept of a teaching machine, Skinner simultaneously introduces a new concept -- that of programming. Unfortunately, the dramatic impact of a machine that teaches may obscure the unquestionably more critical features of programs and programming. Individuals who become enthusiastic about Skinner's approach usually rush out to the shop and knock together some sort of machine; they rarely stay in their chairs and begin writing a program. Skinner tells only enough about programming to tease, and does not tell the novice programmer where to find "a systematic review of available techniques." Machine technology is available; programming technology is not.* If we are to stem the tide of rising educational problems which touch every field of human endeavor, a new science of the experimental analysis of knowledge must be created.

James Evans
University of Pittsburgh

*Editors note: The reviewer should have admitted that he has done some teasing himself! For an excellent discussion of some programming techniques, see Evans, J.L., Homme, L.E. and Glaser, R. "The RULEG System for the Construction of Learning Programs," (Oct. 1959).

4. BIBLIOGRAPHY

a. Introduction of Symbolic Logic to Lawyers

Following is a short bibliography of a number of books which were found helpful to one lawyer who has studied Symbolic Logic without formal training. The references are listed in a recommended order for reading to obtain maximum benefit. The fact that a work is not mentioned in the following list, is not to be considered a criticism.

1. "Symbolic Logic," by Lewis (Alice-in-Wonderland) Carroll (Dover 1958). This book will help you get your feet on the ground. But ignore "Book VII" until later. It is written for intelligent fourteen-year-olds and up. This includes almost all members of the bar.

2. "Logical Design of Digital Computers," by Montgomery Phister, Jr. (Wiley, 1958). Chapter III on Boolean algebra introduces the concepts and also points out how some simple electrical circuits can be employed for performing logical operations.

3. "Arithmetic Operations in Digital Computers," by R. K. Richards (Van Nostrand, 1955). Chapter II on Boolean algebra also introduces the concepts and shows how simple electrical circuits can be employed to perform logical operations.

4. "Boolean Algebra (the technique for manipulating 'And,' 'Or,' 'Not,' and conditions) and applications to Insurance," by Edmund C. Berkeley. The Record of the American Institute of Actuaries, October, 1937 and June, 1938. (Reprinted by Edmund C. Berkeley and Associates, 36 West 11th Street, New York 11, N. Y., 1952). This article is a classic. It represents perhaps the first significant attempt to apply Boolean algebra to a legal problem. The few problems and their solutions are worth studying repeatedly.

5. "An Introduction to Symbolic Logic," by Susanne K. Langer, (Dover Publications, 1953). This is an excellent survey of the field of symbolic logic for the non-professional but good mathematician.

6. "Mathematics and Logic for Digital Devices," by James T. Culbertson (Van Nostrand, 1958). Chapter VI deals with the algebra of classes. Chapter VII deals with the algebra of propositions. This book is full of mathematical problems.

7. "Introduction to Logic," by Patrick Suppes (Van Nostrand, 1957). This is an excellent book from beginning to end. It includes many word problems.

8. "The Elements of Mathematical Logic," by Paul Rosenbloom (Dover, 1950). This book is for the serious advanced student. The information density is exceedingly high.

The foregoing might be considered a first course in symbolic logic for lawyers who have already studied classical logic in some form or another. Familiarity with the work represented by the foregoing references should whet the lawyer's appetite. He will then be able to select his own second course in symbolic logic.

Reed C. Lawlor
Member, California Bar

b. ADDITIONAL BIBLIOGRAPHY

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"An Engineer Looks at Communication and Its Feedback in the Law," 51 LAW LIB. J. 356 (1958).

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"The President's Page," 43 A.B.A.J. 867 (1957).

5. PROBLEMS

a. THE POLICEMAN PROBLEM

"Lawlor's decades-old teaser -- mentioned in many textbooks of logic -- has only one reply in a newsletter connected with the Bar Association: Such an irresponsible policeman should be immediately fired ...."

Y. Bar-Hillel
Hebrew University, Jerusalem

The Policeman problem of Lawlor stems from an article by L. J. Cohen in 22 JSL 225 (1957). R. L. Goodstein, in 23 JSL 417 (1958), furnishes a proof in a variant of first-order predicate calculus that:

1. Something that the policeman says is true, and
2. Something that the policeman says is false.

A critique by L. J. Cohen of Goodstein's proof appears in 23 JSL 420 (1958). ---Ed.

6. READERS LETTERS AND OTHER ITEMS ABOUT MULL

a. COMMENT ON THE FIRST ISSUE OF MULL

"Thanks for your thoughtfulness in sending me the first issue of MULL. I fell obliged to express my reactions to it, and shall be rather frank in this endeavor....

"I take it that it [the article on PROPOSITIONAL CALCULI] is strongly influenced by Fitch and shows everywhere his interesting combination of a mastery of logical notation and consideration of computer purposes. Nevertheless, I wonder how many law people who did not have the privilege of studying with Fitch will be able to understand it on first reading or feel a strong motivation to spend on it a second and third reading? ...*

*Professor Bar-Hillel's comment (about the difficulty that lawyers who are just beginning to learn about the logical theory underlying modern electronic computers are likely to have in understanding presentations of logical systems) is certainly most appropriate. This is a difficulty that the staff of MULL is acutely aware of, and one that we hope to help remedy. Skinnerian learning programs (see 59D3a45) for teaching symbolic logic are currently being prepared by members of the staff and will be made available to subscribers upon request. Space limitations prohibit anything more than a highly condensed presentation of the logical systems in MULL. ---ED.

" ... how questionable the statement is [in the article on MECHANIZATION OF A TAX CODE] that 'the machine ... can deduce ... those answers which are present in the data? So why let such careless claims pass? ...

"Why this very careless use of equations, when inclusions are meant? Only because the term 'equation' carries higher prestige? Or because an inclusion is quickly turned (on p. 3) into a real equation on a very flimsy pretext? And do you really think that an example illustrating that the class of RMDCs is included in the RMDs will help to persuade people that Mehl's clumsy notation is helpful? Of course, Miss James' last passage is quite disarming, but then why write this paper?"

Y. Bar-Hillel
Hebrew University, Jerusalem

"The statement singled out, [in Professor Bar-Hillel's letter] 'the machine...can deduce only those answers which are present in the data', was intended to stress the limitations of the machine; perhaps this would have been better conveyed by the use of the present underlining. Perhaps also the use of the word 'deduce' was unfortunate, especially since the intent was to emphasize that the machine can neither judge nor evaluate.

"...the use of 'equations' was very careless. The word was being misused as a generic term for the symbolic expressions in section 2. Certainly ... 'inclusions' would have been a much better choice.

"But with respect to the 'real equation' used in section 4, that seemed, and still seems, to have been arrived at legitimately. The question asked was: 'Is a manufacturer who makes a domestic sale of current products directly to a consumer subject to the extra tax according to the provisions given in 1?." The only provision dealing with SXd is the one rendered symbolically by f of section 2: RMD $\subset$ SXd. Since the only persons who must pay the extra tax at rate d (i.e., the only members of SXd) according to the provisions of 1 are the members of RMD, we know that SXd $\subset$ RMD. Hence the equation RMD = SXd.

"The question asked is admittedly trivial. But two things might be said. First of all, without the symbolization, the answer would likely be much less obvious. Secondly, the aim was to find a problem that was simple enough to be presented in short scope but which would employ the essentials of Mehl's method, differing only in complexity, and not in kind, from less trivial problems. Though Mehl's method may not be the most elegant, it seems theoretically interesting, nonetheless, that such a mechanization is possible. Moreover it may be (1) that this first formulation will suggest more elegant ones to some reader and (2) that other readers will be stimulated to apply Mehl's methods to less trivial examples.

"Thank you very much for your careful comments."

Patricia James
Yale University

b. TITLE SEARCHING BY PUNCHED CARDS

"I have a somewhat special interest in the subject of data retrieval, in that I am currently president of a lawyer-owned cooperative real estate title plant. We punch a good deal of our title information on IBM cards, but we are anticipating having to go over to some form of electronic memory. So far we have not been able to interest any of the computer people except IBM in our problem, and IBM's smallest RAMAC is bigger than we need and more expensive that we can afford. I should be interested to know if your committee acts as clearing house for information on such problems.*

"Filing and finding title information is of course much simpler than your committee's undertaking of so dealing with legal concepts.

Irwin L. Langbein
Member of the Florida Bar

*One of the purposes of MULL is to provide a bulletin board in effect for the dissemination of such information. ---ED.

c. CONTRACTS ON PUNCHED CARDS

"For several years this organization has been using IBM equipment to place on punch cards significant details of contracts covering the sale of natural gas in interstate commerce. While our experience leads me to be pessimistic about the possibilities of classifying legal precedents, given the limitation of the IBM card to 80 columns and even fewer bases of classification, I am intrigued by your explorations into the possibility of the application of such a research tool to legal problems."

John P. Furman
Foster Associates, Inc.

d. INFORMATION RETRIEVAL ON THE "BIG" ANTI-TRUST CASE

"Having had more than an academic interest of late in the harnessing of data processing equipment in law practice, I was delighted to learn of the latest developments reported in The American Bar News of November 15, 1959. Although I have approached the subject of machine utilization from a somewhat different point of view, namely, to manage trial evidence in the "big case" rather than for research in the law reports, I recognize that many of the underlying problems of resorting to machines are common to both uses. I suspect that if machine techniques were explained to lawyers with respect to an apparently readily soluble problem, which I regard mine to be, they would gain an approach and experience in this highly technical area which might contribute to a successful attack on the barriers to the greater goal.

"As you might suspect, I have written an article on the subject, which is presently being reviewed by a major machinery manufacturer for accuracy. The inspiration for the work came from many years of antitrust trial work and from experience with data processing techniques during a period of employment in industry."

Roy N. Freed
Member of the Pennsylvania Bar

e. SHEPARDIZING AUTOMATICALLY

"...I recall the first time I was initiated into the mysteries of Shepard's, saying to myself that this was an ideal thing to put into IBM cards. It should be easy, given a citation, to run the appropriate cards, and come up with either of the two basic items of information one looks to Shepard's for: (1) is it still the law or has it been overruled or distinguished away, (2) where has it been cited. Certainly in a city the size of New York it would be economically feasible to centralize the

records and machinery and let lawyers call in for the above answers, on some sort of subscription or charge-for-time basis. The answer to (1) could be readily given over the phone whereas the answer to (2) could be a list of citations (with some indication as to which of them parallel others in a different set of reports) typed up automatically from the information in the cards.

"As an extension of this, the Abbot's two series, with their key numbers could, I suppose, also be put on cards so that all a lawyer needs to have in his office is the index, the words-and-phrases and the scope notes. Automatic reprints from microphotographs of the decisions could be supplied on request, thus largely eliminating the need for a law library -- at least for reports series --."

Frank E. G. Weil
Member of the New York Bar

f. PRESERVATION OF LEGAL RECORDS

"As chairman of the Committee for the Preservation of Records of the American Society of Legal History, I am very much interested in the work you are doing in the use of punch card or other machines for the classification of records. I have discovered that Bar Associations and public officials are not very much interested in the expense and thought necessary for the adequate preservation of ordinary court house records and that as a consequence, many of them are deteriorating as a result of neglect, or ultimately are consumed in the traditional court house fire. One of the arguments that I have had raised on several occasions when I have discussed the matter with State officials, had to do with the fact that the records had reached such tremendous proportions they were of no use to anyone unless they were classified somehow according to subject matter rather than entirely by the names of the parties.

"Certainly, from the standpoint of research, an index system would be desirable, but in order for one to be adopted, it would have to be extremely simple and inexpensive. We have, therefore, been considering the use of a punch card system, so that any researcher would be able to find the material that he needed, although we did not believe it practical to have a system elaborate enough that it could provide very much in the way of information itself. It was our thought that a simple system could be prepared that could actually be used by the clerks in various counties. We are concerned at the moment with records normally kept in the offices of clerks of first instance and the other records that would normally be found in a court house, although it is a fact that appellate records and proceedings are fairly well kept and preserved and that there are materials available in connection with them, they certainly need some better record of classification that we have now.

"On the other hand, much of our legislation and legal theory ignores entirely the vast experience that is accumulating in the trial courts and it seems to me that if the material could be made available to researchers, even on a sampling basis, the results might very well justify the installation of a classification system."

W. H. McBratney
Member of the Arizona Bar

g. JUDGMENT OF PERTINENCY OF INFORMATION

"In conducting a legal research, there is much more involved in doing a satisfactory job than just locating the pages in bound volumes where pertinent portions of decisions or other information can be found. In other words, in my opinion, the proper handling of a legal research involves considerably more than "memory" or an extensive index which will enable a reader to quickly and easily locate all entries under a particular subject heading. Thus, there is the need to recognize, as the search continues, the pertinency or non-pertinency of any particular bit of recorded information, and the further step of utilizing the principle or concept encompassed by the pertinent record to lead the searcher to possibly more pertinent information or to a new or side approach to a problem.

"If the only problem confronting satisfactory 'electronic law research' is the retrieval of information which is classified under certain established subject matter headings, it appears to me that the electronic machines and information necessary for such electronic legal research are already available. Thus, it would be possible to encode on punch cards or other memory devices the various topic headings now found in the West Publishing Co. reporter series or any other legal digest, and using such cards, the lawyer could have a complete list of pertinent citations printed out immediately by the machine. However, a worthwhile solution to the electronic law research problem appears to me to be more complex than this mere 'mechanical indexing'.

"I shall look forward to receiving copies of the 'MULL' publication, to see what advances are being made in this field, for certainly it is an area in which great advances can be made for the benefit of the practicing attorney, his clients and the administration of justice."

Carroll Palmer
Member of the District of Columbia Bar

h. THE WEST KEY SYSTEM -- AN ADEQUATE CLASSIFICATION SYSTEM?

"I refer to the note on Electronic Law Research in the November 15, 1959 issue of the American Bar News. Although no scientist, I have been

moved to give considerable thought to the problem by (a) the interest of a brother-in-law who, professionally engaged in electronic computer development, is one of five men who have been so engaged ever since the development of Mark I computer at Harvard under Navy auspices during the war, and (b) several neighbors engaged in sales and sales development activity with a large manufacturer of such devices. On this basis, I venture the comments which follow.

"First, the search for precedents in law, like most other operations involving memory, would seem to involve an often automatic (and sometimes even unconscious) formulation of the salient facts. The client tearfully describes an explosion on a railroad station, emotionally and in detail. We strip away the detail, and decide to reread Palsgraff. Or, after struggling through the verbosities of a complex indenture of trust, a 50-page will and a petition for construction of these instruments, we reduce the jungle of words to a simple formula of life estate, power of appointment, and gift in 'default' of exercise -- and reach perhaps for those portions of the Digests which deal with the Rule Against Perpetuities. The process is not always immediate nor simple, but doesn't it usually follow this form? If so, the matching of salient or essential facts -- once these facts have been specified by counsel -- would certainly seem a feasible task for a punched-card sorting machine. Presumably electronic storage should be equally feasible, and the sorting far more rapid.

"One solution to the problem of coding is already implicit in these observations. The Key system of the West Publishing Company is something with which every law student learns familiarity at an early date. It is certainly more detailed than the Dewey system of library indexing. To be sure, the major digest topics in West are not coded as are the subdivisions within each, but it should not be difficult to attribute numerical values to these. In so doing, a good mathematician might well find it preferable to abandon the alphabetic order in which West presents its major topics, substituting a numerical code which would embody somewhat further the relationships between such topics -- e.g., those between "Trusts and Trustees", and "Executors and Administrators". This would seem a problem in manipulation rather than psychology. Once coded (and frequently -- as in West -- coded to more than one key number or topic) the machine should have no difficulty in producing all citations relevant to the specified pattern of salient fact initially developed in counsel's analysis.

"Since the device can remember but cannot think, it would seem a mistake to expect it to develop the initial analysis as well as the citations. The machine could be instructed to disregard the fact that Palsgraff was a railroad situation and search through cases involving aircraft or other carriers -- or even cases involving an analogous duty of care by a defendant other than a carrier -- but such instruction is properly the function of counsel rather than the scientist. If counsel is incapable in the first instance of a formulation which will elicit for him all relevant prior decisions, this will usually be done for him in the

decisions first furnished by the device; he is then free to call on the electronic memory a second time, to obtain decisions or dicta on the points he initially overlooked. If the device could make qualitative judgments, to be sure, it could then eliminate the human failings and weaknesses in the practice of law. But would this be entirely desirable? Even if possible (which I doubt), the value of leaving to a machine the relative weights to be accorded different theories of judicial decision seems highly dubious...."

"I suppose that my thoughts might be summarized as suggesting that Mr. Biunno's search for a 'concept of relevance' should be limited to the establishment of an adequate classification system -- and that the qualitative, value-judgment aspect thereof should continue to rest with the practitioner."

Howard R. Patch, Jr.
Member of the New York Bar

i. AMERICAN ASSOCIATION OF LAW LIBRARIANS COMMITTEE ON THE APPLICATION OF SCIENTIFIC DEVICES TO LEGAL LITERATURE

"At the 1959 Annual Convention of the American Association of Law Libraries, its Committee on the Application of Mechanical and Scientific Devices to Legal Literature was reorganized to comprise three subcommittees, respectively on Decices, Audio-Visual Materials and Microfacsimiles. Through that expanded Committee the profession of law librarianship hopes to broaden its efforts to investigate, evaluate and participate in the advancement of the new scientific bibliographic methods. The Devices subcommittee, as part of its 1959-60 program, plans to prepare a bibliography of literature in the field of mechanized retrieval of legal literature and a survey of the existing or planned scientific devices for such retrieval.

"The program and purposes of the committee are:

(a) To keep abreast of actual developments in the field of the application of scientific devices to legal literature and to advise the Committee and the Association.

(b) To follow the literature in the field and report on same to the Committee and the Association.

(c) To evaluate and, where feasible, participate in conferences, projects and both theoretical and practical efforts of others in this field and to report on such evaluation and participation to the Committee and the Association."

Roy M. Mersky
Washington State Law Librarian

j. RESOLUTION OF THE ST. LOUIS LIBRARY ASSOCIATION

"Yesterday [Dec. 8, 1959] the members of the Law Library Association of St. Louis met at ... their 121st annual meeting. The Law Library Association of St. Louis has, and runs, one of the oldest law libraries in the country, and one of the best. It has some 1050 current members, some 76,000 law books, and very little shelf space left.

"Because of that latter limitation, and in keeping with the progressive spirit that has dominated its membership for the past 121 years, the Association passed unanimously the following resolution ...

> RESOLVED, that this Association encourage and cooperate with the American Bar Association's Committee on Electronic Data Retrieval, and that it urge the American Association of Law Libraries to do the same, to the end that legal research by machine will become possible at some time in the foreseeable future, to the great benefit of all practicing lawyers and the effective administration of the law.

"In the Smithsonian Institution in Washington many early models of various types of machines are on display. Col. Lindberg's 'Spirit of St. Louis' is there, several high wheel bicycles, and an early model T Ford. Hundreds of thousands of people see them annually, and are deeply impressed.

"If, in all the major law libraries of the country there were placed on display replicas of some early model data retrieval device, with suitable placards explaining the need for further development of that device in the field of legal research, it could be that the time when legal research by machine is an accomplished fact would be the sooner reached.

"Since the function of the ABA's Committee on Electronic Data Retrieval is primarily one of 'education and publicity', to quote its Chairman Mr. Richard F. C. Hayden, I am suggesting to the President of our Law Library Association, Mr. G. A. Buder, Jr., that in communicating with the American Association of Law Libraries in connection with the foregoing resolution he suggest that its encouragement and cooperation be along those lines of 'education and publicity', and that it consider the implementation, by its member law libraries, of the above suggested display idea."

J. Raymond Dyer
Member of the Missouri Bar

k. **INFORMATION WANTED ON INDEXING FIELDS OF LAW**

Some members of the EDR Committee who are seeking to arrange for a demonstration of mechanical retrieval techniques in law would like to receive from anyone:

> "information regarding work that has been done in the field of indexing the facts of published cases in various fields of law."

Reed Lawlor indicates that the group:

> "would like to have such information available for either small or substantial bodies of law so that our Committee [EDR] can arrange to have cards punched for possible use in a demonstration at the next ABA Convention."

Information should be sent to:

Reed C. Lawlor
412 West 6th Street
Los Angeles 14, California

University of Michigan
Law Library
Ann Arbor, Michigan
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